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of Washington Industrial Commission¹ says, "These results seem to disprove the theory that fatigue is the prominent cause of accidents, because accidents are here shown to happen at the hours when the workmen are least fatigued." On the fatigue theory it might naturally be expected that most accidents would happen after 11 A.M. and 5 P.M. The actual hour of the high point of curve of accidents shows how important are the facts and how necessary of proof the theories.

After much discussion, the tendency to speed up employment has been incriminated, as the predisposing conditions for the occurrence of accidents. This desire comes over the workman when he is not yet fatigued, but has been employed for several hours. He starts the morning's work "cold," and as he warms to his work, the danger of mischance because of haste becomes greater. Just when the speeding up reaches a climax in the morning hours, most accidents happen. The same thing is true in the afternoon. Workmen feel sluggish after their lunch, but after an hour of work warm up again, and by about 3 o'clock they are doing their most rapid work, and are at the same time more subject to accident.

With regard to accidents among children, however, there is no hour of maximum. Accidents occur at all times, and they are comparatively much more frequent among children than adults. The United States Bureau of Labor reported that "there is clear evidence of great liability to accident on the part of children. Though employed in the less hazardous work, their rates steadily exceed those of the older co-workers, even when in that group are included the occupations of relatively high liability." This was said with regard to the southern cotton mills, but the same thing is true of practically all industries in which children are employed.

The results of these accidents come to the physician. We are devoting much time to the prevention of disease, and we should be ready to give attention also to the prevention of injury. Virchow used to say that the ideal

¹ Report of State of Washington Industrial Commission for 1912, p. 178.

function of the physician, besides that of reliever of human ills, is to be the attorney of the poor for the prevention and relief of social ailments, and, above all, the prophylactic of their physical consequences, whether in lowered health or in maiming injuries.—*Journal of the American Medical Association.*

SCIENTIFIC BOOKS

The Ants of the Baltic Amber. By W. M. WHEELER. Schriften der Physikalisch-ökonomischen Gesellschaft zu Königsberg. LV. (1914.) Pp. 142.

Among the very numerous writers who have discussed the structure and habits of ants, few have had anything to say about the early history of the group, as shown by the paleontological record. Large collections of fossil ants have remained for many years in museums, unnoticed by students, who seem never to have conceived that the record of the past would throw any light on the present. As long ago as 1868, Gustav Mayr published a very important paper on the ants of Baltic amber; in 1891 Emery gave an account of fourteen species found in Sicilian amber, and at different times other writers have described fossil ants. Thus the total numbers of recorded species of fossil ants is well over 200, but many of these are very imperfectly known, and probably assigned to the wrong genera. The materials collected and then neglected have been very extensive, and in particular those from Baltic amber and from the Florissant shales in Colorado, numbering thousands of specimens, have invited a complete revision of paleomyrmecology. It is very fortunate that the rich collections from these two localities have fallen into the hands of Dr. Wheeler, who has undertaken the great task of setting them in order. The first section of this work, on the ants of Baltic amber, has now been published. Dr. Wheeler had the loan of the whole collection from the Geological Institute at Königsberg, as well as that of Professor R. Klebs, together with some smaller lots, the total number of specimens examined being 9,527. Of one species alone, *Iridomyrmex goepperti*, he saw 4,539 individuals. Up to the

time of Wheeler's studies, 24 genera and 52 species were known from Baltic amber; he now adds 21 genera and 40 species, in addition to revising those already known.

No ants are known from the Mesozoic; one or two recorded as such prove to belong to quite a different group of Hymenoptera. The oldest fossil ants, by far, are those described by Scudder from the Eocene of Green River and White River in Wyoming and Colorado. These, unfortunately, are poorly preserved, and afford very little information. The beds along White River near the Colorado-Utah boundary are certainly Eocene and not Oligocene, as has repeatedly been stated, apparently from confusion with the White River group of Oligocene beds from which mammals are obtained. Further collections from the insect-bearing Eocene rocks of the west are much to be desired, as well as a more complete examination of those already obtained, for there is a chance to discover very important entomological facts. In Europe, the Lower Oligocene contains the earliest ants, but includes the Baltic amber, as well as the beds at Aix in France, and probably the Gurnet Bay deposit in the Isle of Wight. This last, from which I have recently described a number of ants (*Dolichoderus*, *Leptothorax*, *Æcophylla* and *Ponera*) is perhaps later than the amber. The Middle and Upper Oligocene and all three divisions of the Miocene (the latter including the important localities Eningen in Baden, Radoboj in Croatia and Sicilian amber) have afforded fossil ants in Europe, and there is a single Italian locality assigned to the Lower Pliocene. Between the last and the Pleistocene is a blank. The supposed Miocene record from Spitzbergen is to be deleted, the specimen being the abdomen of some insect, and wholly unrecognizable.

Thus it appears that our first real knowledge of fossil ants begins with the amber, probably at least two million years ago. What development has the group shown in all this long time? To what extent are the remarkable habits and structures of modern ants products of recent evolution? From Dr. Wheeler's researches we gather these facts:

1. Of the amber genera, over 55 per cent. are still living; that is to say, 24 genera, of which four are at present cosmopolitan; four universal in the tropics, but invading semi-tropical or temperate regions with some of their species; four essentially paleotropical; five belonging to an Indomalayan and Australian series; six circumpolar; and one (*Erebomyrma*) known to-day by two species, one in Texas, the other in Peru.

2. The extinct genera are mostly allied to paleotropical forms. There is, however, little affinity with the African fauna.

3. It is by no means certain that the amber fauna all belongs strictly to the same time or general locality; yet ten cases are recorded in which two species of ants exist in the same block of amber, proving their strict contemporaneity.

4. Since the amber, "the family has not only failed to exhibit any considerable taxonomic or ethological progress, but has instead suffered a great decline in the number of species and therefore also in the variety of its instincts, at least in Europe." Already, in the Lower Oligocene, the subfamilies and modern genera were established; even some of the species were almost identical with those of to-day. *Formica flori* of amber is almost exactly the modern *F. fusca*; other species of *Formica* represent different subdivisions of the genus, quite as we have them to-day, though there is no representative of *F. sanguinea*. Other amber ants show similar resemblances. Not only was polymorphism fully established, but the larval and pupal stages show such peculiarities as we see to-day; thus the larvæ of *Prenolepis* had already lost the cocoon-spinning instinct. The amber *Iridomyrmex* pupæ were likewise naked, just as they are now. Specimens of *Lasius* carry gamasid mites, showing that these arachnids had already developed their specialized myrmecophilous characters. So also, aphids were kept by ants in those days.

5. Perhaps it would hardly be going too far to say that if the ants of to-day were likewise preserved in amber, and were submitted to a future entomologist along with those of the

Oligocene, without any information concerning their relative ages, he would hesitate to declare which was the older. At the same time, the amber ants do show some relatively primitive features, and *Prionomyrmex*, from the amber, is absolutely the most primitive of known ants. The nearest living relative of *Prionomyrmex* is the Australian *Myrmecia*. It must also be noted that the amber ants have not so far shown any marked soldier types, like that of *Pheidole*.

Some years ago I had occasion to study the bees of Baltic amber and found all the genera to be extinct, although the fossorial wasps from the same material, so far as seen, were strictly of modern genera. It is certainly true that different genera and families of insects differ greatly in their antiquity, and some of those which we might naturally suppose to be relatively recent are in fact very old. Such studies as this of Dr. Wheeler's supply a firm foundation of facts to take the place of guesses, and are of inestimable value to students of evolution.

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The Examination of Hydrocarbon Oils and of the Saponifiable Fats and Waxes. By DR. D. HOLDE. Translated by EDWARD MUELLER, from the fourth German edition. John Wiley and Son, Inc. 1915. Pp. 483.

To present in the limited space of this book even a brief description, and standard methods of examination of the great variety of petroleum products and fats, demands a comprehensive knowledge and critical judgment. In the last edition of Dr. Holde's work this object has been well accomplished.

Petroleum and its products, the most voluminous part of the subject, occupy the larger space, yet the saponifiable fats and their products are quite comprehensively included.

In its general plan the book presents brief descriptions of properties and composition, general reactions, behavior towards reagents and standard quantitative physical and chemical methods of examination. There is a great condensation of subject-matter by means of the

97 tables that are interspersed throughout the book, and that summarize much valuable data in connection with the subject in hand.

Products recently brought into commercial use are described with methods of control. The physical examination of the hydrocarbon oils and their derivatives includes specific heat, heat of vaporization, viscosity, calorific power, coefficient of expansion and optical properties. Rotary power of mineral oils receives attention, more especially in European oils where it is apparently more general than in American crude oils, or their products. The recently proposed formolite reaction (formic aldehyde and concentrated sulphuric acid) on mineral oils is described, and some other recently proposed methods. Large space is properly devoted to lubrication, lubricants and greases, asphalts and tars. With the marvelous expansion in the use of motor power, the several recent methods for increased output of gasoline from inferior oils and the general replacement of kerosene for lighting, it appears that gasoline and lubricants will soon be the principal products refined from petroleum. Much serviceable information is presented concerning non-drying oils and solid fats, vegetable semi-drying oils, and drying oils, animal oils and oils from marine sources. The chapter devoted to technical products derived from fats and oils, blown oils, soaps, soap powder, turpentine wood oils, boiled oils, resins and allied products both in description and methods will be found useful.

Certain looseness in statement appears here and there. Caustic soda is of equal necessity with sulphuric acid in refining to remove sulphonic acids and particles of sludge that permeate the oil after the acid treatment. Fuller's earth is used only after acid treatment to remove color. The two general types of petroleum suggested are not inclusive. The writer has a barrel of Russian crude oil that distills to less than one per cent. below 350° at. pres. California, Wyoming, much Kansas, and southern crudes do not fall within this classification. Mercaptans are not contained in American crudes so far as known. On page 63 it is mentioned that the method of Carius